Defining Favourable Conservation Status in England

Natural England's approach

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Mousley, S., Van Vliet, W. & Cork, C.

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Natural England Project Manager

Sireesha Nemana – Project Manager, Defining Favourable Conservation Status Project, Natural England

Authors

Sally Mousley – Senior Advisor Defining Favourable Conservation Status Project, Natural England

Wilbert van Vliet – former Senior Advisor International Sites, Natural England.

Christina Cork – former Principal Advisor Strategy & Government Advice, Natural England

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Further information

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Contents

1. Purpose of this document

This document describes Natural England’s approach and methods for defining favourable conservation status (FCS) in England. It serves as a reference document for those seeking to better understand and develop definitions of favourable conservation status and provides guidance on principles, considerations, and methods to use.

2. Natural England's interpretation of favourable conservation status

Natural England interprets favourable conservation status as the situation in which a habitat or species is thriving throughout its natural range and is expected to continue to thrive into the future. This interpretation is consistent with that used by the Statutory Nature Conservation Bodies in their Common Statement on Favourable Conservation Status (JNCC 2018).

Favourable conservation status encompasses all occurrences of a habitat or species within its natural range, both in the wider environment and in protected sites. This document refers to the habitats or species which are the subject of favourable conservation status definitions as 'features'.

A definition of favourable conservation status sets a minimum threshold. Below the threshold habitats and species are in unfavourable conservation status and may require conservation action to ensure they can contribute fully to functioning ecosystems. Above the threshold, features are in favourable conservation status and they are thriving throughout their natural range and are expected to continue to thrive in the future.

For habitats, favourable conservation status means:

- Maintaining viable examples of a habitat across the range of different climatic, geographic, physical and process conditions in which it is naturally present, and to conserve the biological diversity (species, genetics, ecosystem interactions) associated with the habitat.
- There is sufficient area, pattern and quality of habitat across its natural range to support dependent associated species. The achievement of favourable conservation status for habitats will be reflected in the achievement of favourable conservation status for the associated species.
- Securing optimal conditions for the habitat (including its inherent diversity of species and ecosystem interactions) through the restoration of natural ecosystem function (or at least as far as this is possible). The contribution from an individual site will thus be dynamic in terms of its condition and its composition at any one point in time as it responds to the functioning of natural processes.

For species, favourable conservation status means:

- More than avoiding extinction or conserving one viable population.
- Securing the underlying inherent diversity (genetic and phenotypic) of a species by maintaining thriving populations across its natural range, as far as possible by the restoration of natural ecosystem function. The contribution from individual sites may be dynamic in terms of the occurrence of species at any one point in time.

A definition of favourable conservation status is forward-looking, specific, measurable, applicable, transparent, credible and consistent with the scientific principles that underpin the interpretation of the concept.

It is a realistic England-scale ambition for a habitat or species, based on its ecology. It is not a target for delivery, but the ambition described in a definition can help to inform national and local policies that set delivery targets.

3. Principles of defining favourable conservation status

The following principles have been established by Natural England to guide the definition of favourable conservation status. Not all the principles will be equally applicable to all features and deviations from some principles may be justified based on the character of the habitat or species.

Principle 1: The overall objective of favourable conservation status is to conserve biodiversity

The overall objective is to conserve biodiversity, at genetic, species and ecosystem level, including ecosystem interactions. When favourable conservation status is reached for a habitat or species, the biological variation that is associated with that feature should be thriving within naturally functioning ecosystems.

Principle 2: A definition of favourable conservation status is based on the best available evidence on the ecology of the habitat or species

The definition of favourable conservation status should be based on ecological evidence as far as possible, recognising that the knowledge base is highly variable and usually incomplete. Pragmatic decisions based on best expert judgment, proxy values and rules of thumb may often be needed for a workable definition. Favourable conservation status definitions can be revised as ecological understanding advances.

Principle 3: A definition of favourable conservation status will reflect the ecological requirements for favourable conservation status in England

Below the defined level, features are in unfavourable conservation status; above this level features are in favourable conservation status. Favourable conservation status does not set a desired upper limit on a species or habitat; it simply indicates when a species or habitat is thriving throughout its natural range with good prospects of continuing to do so in the future. Higher levels than favourable conservation status may be desirable for other purposes (for example, to support sustainable use or ecosystem services) but this does not influence how favourable conservation status is defined.

Principle 4: Economic and technical factors do not play a role in defining favourable conservation status

When *defining* favourable conservation status only ecological evidence and expertise is considered (Principle 2). When developing restoration strategies and targets for a habitat or species, including trajectories for *achieving* favourable conservation status, economic and technical factories can be considered. For example, whether finance is available or practical mechanisms required to achieve favourable conservation status.

Principle 5: The definition of favourable conservation status should be practical for the different situations and scales in which the concept is used

The units used to define favourable conservation status should enable the translation of the definition to different spatial scales. For reporting purposes, favourable conservation status may be translated to Favourable Reference Values (FRVs).

Principle 6: Favourable conservation status is ultimately achieved at the level of the natural range of a feature

The concept of favourable conservation status can be applied at different geographic scales. Countries may specify favourable conservation status for the part of the natural range that is covered by their country. The approach described in this document defines favourable conservation status in England.

Similarly, favourable conservation status may be specified for individual regions or sites. A definition of favourable conservation status at one spatial scale (for example, local, country, UK) can be seen as a contribution to achieving favourable conservation status throughout the natural range of the habitat or species.

Principle 7: All parts of the natural range and distribution in England should contribute towards favourable conservation status

We would expect contributions towards favourable conservation status from the whole of the natural range and distribution of the habitat or species. Favourable conservation status would be compromised if a feature has an unfavourable attribute in a significant part of its range. Different attributes may need to be judged at different scales.

Principle 8: The natural range and distribution of the feature within England is defined first

The natural range and distribution is the geographic distribution pattern that includes all significant ecological variation. This is defined first. Subsequently, the favourable habitat extent, or the favourable population of a species, is determined by the size needed for the feature to thrive in the different localities that make up its natural range and distribution. This can be the sum of multiple sustainable meta-populations or habitat patches.

Principle 9: Favourable conservation status is not automatically determined by a historical value or a reference year

The definition should be forward-looking. However, historical data and current status and trends can inform a judgment on what is favourable conservation status.

Principle 10: Favourable conservation status is not necessarily the maximum ecological potential of a feature.

However, the ecological potential can inform a judgment on natural range and distribution and what may be ecologically feasible to restore in terms of size and quality.

Principle 11: The contribution of a habitat patch to favourable conservation status is based on ecological potential

Habitat patches should be considered in terms of ecological potential rather than statutory designation, for example, Site of Special Scientific Interest (SSSI) or Area of Outstanding Natural Beauty (AONB).

Principle 12: The favourable conservation status definition should expect and accept natural fluctuation

Defining favourable conservation status with reference to more naturally functioning ecosystems indicates that we expect there to be dynamic change within the spectrum of habitat conditions. This is important for biodiversity and ecological resilience in the face of climate change. Optimal habitat conditions will not occur everywhere at the same time and may change location over time, but there should always be sufficient available within the natural range to satisfy favourable conservation status for all features.

4. Overall approach

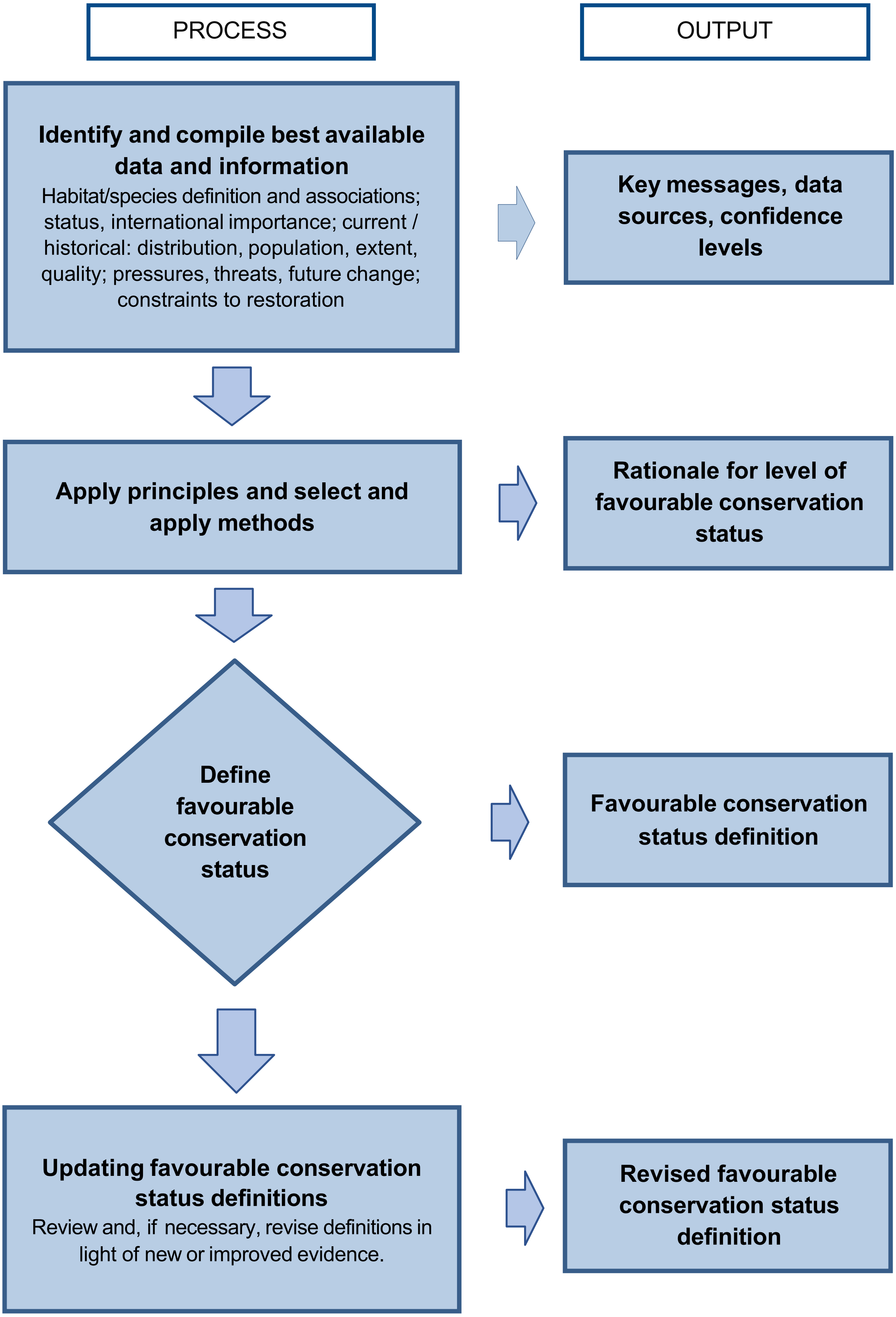
Due to the widely varying nature of habitats and species, there is no single method nor unambiguous scientific answer to the challenge of defining favourable conservation status.

Some habitats are defined at landscape or system level (for example, estuaries, blanket bog) whereas others are defined by specific plant communities, stages of succession (for example, embryonic dunes), geology or human use. Species may be widespread, common, mobile, rare, range-restricted or sedentary. There are differences between features that depend on natural processes and those that depend on continuing human intervention (for example, hay meadows). Finally, there may be significant variation in the availability of data and evidence.

The overall approach described here is thus to make feature-specific judgments on what favourable conservation status is for the habitat or species in question, using the best available information and guided by the principles to ensure that definitions are as consistent and ecologically integrated as possible. The definition of favourable conservation status is a judgment rather than a scientific truth. This requires the compilation of the best available evidence and the application of the relevant principles and methods to arrive at a judgment for favourable conservation status.

Definitions may need to be revised and updated as further scientific evidence becomes available and our understanding of favourable conservation status is improved.

4.1 Steps in the approach



5. Collation of evidence and key points

The basis of a definition of favourable conservation status is the best available evidence on the ecology of the habitat or species. Therefore, the key first step in the production of a definition is an audit of the available data and identification of the key sources of information, including spatial data. Relevant data and key points from the evidence should be collated and set out within the definition. The evidence should cover the parameters and considerations outlined in sections 5.1 and 5.2 below.

The choice of the data used within the definition needs to be explained, for example, if more recent data is less reliable. Where there is a lack of evidence it may be necessary to use expert opinion. The definition should be clear when this is used and why.

The definition should also describe the feature and include references. Spatial data used to produce the definition should be stored or referenced.

One of three confidence levels (High, Moderate, Low) should be assigned to all blocks of evidence, or sub-sections within the definition, based on the quality of the evidence, its applicability and the level of agreement. This is particularly important for features where interpretation of the data may vary between interested parties.

The summary should highlight data uncertainties and indicate confidence levels for the definition.

The assessment of the confidence level to be used is shown in the following matrix (after IPCC 2010). White = High confidence; Light blue = Moderate confidence and Dark blue = Low confidence.

Limited evidence **Strong agreement**	**Medium evidence** **Strong agreement**	**Robust evidence** **Strong agreement**
Limited evidence **Medium agreement**	**Medium evidence** **Medium agreement**	**Robust evidence** **Medium agreement**
Limited evidence **Weak agreement**	**Medium evidence** **Weak agreement**	**Robust evidence** **Weak agreement**

Quality of evidence is defined as follows:

- Robust evidence is that which has been reported in peer-reviewed literature, or other reputable literature, from well-designed experiments, surveys or inventories that shows signs of being applicable generally.
- Medium evidence is that reported from well-designed experiments, surveys or inventories but from only one or a small number of sites, with uncertainty over its more general applicability, or is correlational or circumstantial evidence.

- Limited evidence includes ‘expert opinion’, based on knowledge of ecological factors that plausibly suggest an effect, but there is no circumstantial or direct evidence available.

Agreement is defined as follows:

- Strong agreement is consensus across the literature and amongst those with expertise on the habitat or species.
- Medium agreement is common consensus across the literature and amongst experts but there are some differing papers or reports and/or some differences of opinion.
- Weak agreement is little consensus across the literature and amongst experts and, possibly, many different findings and/or opinions.

5.1 Parameters

The parameters listed below are used to define favourable conservation status in England.

Habitats	Species
Natural range and distribution	Natural range and distribution
Area	Population
Structure and function	Habitat for the species

Evidence relating to each of the parameters should be considered (with reference to the aspects discussed in section 6) and, where possible, a level for favourable conservation status defined for each parameter, leading to an overall definition of favourable conservation status.

5.1.1 Natural range and distribution

Range is the envelope around the spatial distribution of the feature. As well as defining the overall range size and envelope boundary, the definition should also describe the favourable distribution pattern within the range.

Because favourable conservation status requires a habitat or species to thrive throughout its natural range, all parts of the natural range should contribute to favourable conservation status (principle 7). Defining the natural range and distribution therefore drives the other parameters of favourable conservation status: multiple sustainable populations or habitat patches may be needed in different geographic regions to conserve the feature in its natural range. A definition of favourable conservation status therefore starts with defining the natural range and distribution within which the feature should be thriving (principle 8).

All relevant parts of the natural range and distribution, covering the full geographic and ecological variation, should contribute towards favourable conservation status. However, the specific contribution of each location can be different, reflecting natural variation of landscapes to support the feature. The favourable range and distribution does not have to include every single patch that a feature occupied at some point in history. For instance, the feature may have occurred, and may still occur, at a site outside of its natural range due to human modifications that have created artificially optimal conditions.

For habitats, it is important to consider the role the habitat plays in supporting species assemblages throughout their range. Favourable range and distribution may be informed by the distribution pattern of vegetation types or other aspects of ecological variation.

There may be evidence of the need for a certain range and configuration to support the favourable size and quality. For example, evidence on Minimum Viable Populations, the need to buffer against (natural) disaster, minimum desirable functioning area of habitat, patch dynamics, spatial connectivity, landscape resilience, refuges, etc.

5.1.2 Habitat area

The favourable habitat area needs to be sufficiently large to ensure the long-term viability of the habitat throughout its natural range, including the species that may rely on the habitat for their survival. For favourable conservation status, the habitat across its favourable range and distribution would need to be sufficiently large for the necessary structures and functions to exist in a landscape setting and to promote the recovery of any threatened species associated with that habitat.

5.1.3 Species population

The favourable population should secure the inherent diversity of the species across England through maintaining viable representation across the natural range and distribution. This relates to the ability of the species to adapt to change, facilitated by having a robust genetic basis. As far as this is possible, the favourable population should occur in naturally functioning mosaics that confer ecological resilience.

5.1.4 Structure and function

This section should focus on the structure and function attributes relevant at an England scale. That is, those attributes that may vary from place to place but for which the entire resource in England needs to provide sufficient amounts and variation to sustain associated biodiversity. These attributes are the key properties of the habitat resource. They should be interpreted and evaluated by reference to the extent to which they are provided by the natural functioning of ecosystems, in order to properly consider ecological context and resilience.

Structure attributes

These are the physical and biogenic components of a habitat type. For example: bare ground; vegetation structure; corals in a reef; gravel in a river. The structure attributes should provide a description of the constituent microhabitats, smaller-scale habitats and habitat elements used by associated species. The definition should describe the structure attributes necessary for favourable conservation status, including the range of plant communities associated with the feature (where appropriate).

Function attributes

These are the ecological processes necessary for conservation of the habitat which may apply in varying temporal and spatial scales. For example: soil characteristics, water chemistry, hydrology, nutrients, air, management. The definition should describe the function attributes necessary for favourable conservation status.

Patch size and connectivity

Patch size is the 'size of minimum desirable functioning', that is the size at which the habitat is large enough to support natural processes within functional ecological units, capable of maintaining long-term sustainability. This could be, for example, the minimum scale needed for internal ecological processes (such as internal abiotic variation, space for structural variation, space for internal geomorphological processes such as sand blow) or the spatial requirements for viable populations of species. In general, larger habitat patches are more resilient, and support a higher diversity of species. Some semi-natural habitat types, for example, coppice woodland, can exist in much smaller patch sizes where traditional management practices are in place. However, smaller patch sizes are unlikely to support the full range of associated species. Where possible, the favourable conservation status definition should specify the minimum patch size.

For some habitats, size is determined by natural ecosystem function (for example, rivers, blanket bog) and for these habitats a consideration of patch size is not applicable.

Some habitat types will naturally exist in small patches as part of a wider mosaic or complex. For these habitats, where possible, the 'size of minimum desirable functioning mosaic' should be defined. This is the scale at which ecological processes start to function across the matrix of habitats. This could be helpful in indicating the minimum size for core areas, that is, groups of well-functioning habitats associated in a landscape.

Connectivity between habitat patches is another aspect that helps to confer resilience to environmental pressures and change. Fragmentation and isolation are key components of species decline. Connectivity could be structural – the spatial layout of habitat patches across a landscape – and functional – relating to the movement of species between patches of habitat. Increasing connectivity increases the opportunities for species to disperse between habitat patches and colonise new ones. It supports genetic diversity by aiding gene flow through subpopulations and facilitates the re-colonisation of habitat patches that have lost a species due to some chance or extreme event. It may also facilitate longer-distance movement by species, supporting range shifts as environmental conditions change, as well as migration. However, increasing connectivity may, in some cases, increase risks from invasive non-native species, pests and diseases. There are also natural discontinuities in landscapes that are important to maintain to support certain biological communities, for instance, watersheds and waterfalls.

The importance of patch size can be affected by the degree of connectivity between habitat patches and the mobility of the species. Larger habitat patches are more important where there is little connectivity between habitat patches and for species with poor mobility.

Where possible, the favourable conservation status definition should specify the connectivity required between habitat patches. Habitat patches can be connected in three main ways:

- Functionally by mobile species, through the means of 'stepping-stones' – small patches of suitable habitat that are transiently used areas between large habitat patches; or
- Through the land between habitat patches, which can be more or less 'permeable' for the movements of species but cannot be classed as 'habitat' where the species can live and sustain itself for periods of time.
- Physically, by corridors of habitat between core habitat patches.

Habitat quality

The definition should specify the proportion of the structure and function attributes that need to be met in habitat patches to achieve favourable conservation status. It may not be necessary for each attribute of structure and function to reach optimal conditions for the feature in every habitat patch. Natural variations in local conditions need to be taken into account, including natural dynamic change which is often needed for favourable conservation status. It is important that the definition of habitat quality is couched in a way that supports the general ambition to deliver favourable conservation status for individual features through restoration of more naturally functioning ecosystems as far as this is possible. If the entire habitat resource can support the relevant ecological variation across the country the habitat contributes to favourable conservation status.

Associated species

This attribute encapsulates the ability of a habitat to support dependent associated species.

At England scale, the habitat should provide the range of microhabitats and smaller-scale habitats for thriving species populations so that associated species are also in favourable conservation status. Therefore, when defining favourable status for the habitat, the favourable levels should ensure that the associated species are also in favourable conservation status. Characterisation of how the habitat sits (or can sit) within naturally functioning habitat mosaics is important to make the link with as many associated species as possible.

Within this approach, IUCN red lists (or information on declining species where red list assessments are not available) are used as a proxy to check that the habitat provides the structural heterogeneity needed to support thriving populations of associated species. The definition should identify threatened or declining species dependent on the habitat and, where possible, use information on the ecology of those species to help define the favourable parameters for the habitat.

5.1.5 Habitat for the species

This parameter covers all the biological and physical resources used by the species during its lifecycle. It includes both the extent of habitat required to support the favourable population throughout the favourable range in the long-term and the quality of habitat required. Where possible, the definition should specify the extent and quality of habitat required for favourable status, taking into account how optimal requirements for the species are (or can be) delivered through naturally functioning habitat mosaics.

5.1.6 Future prospects

Future prospects are not considered as a separate parameter within this methodology. A definition of favourable conservation status is a long-term ambition for a habitat or species, based on its ecology. It is not an assessment of the current conservation status nor a plan for immediate conservation action. Therefore, within a definition, sustainability into the future is considered when setting favourable levels for each of the parameters so that good future prospects are secured. This approach is consistent with the principles outlined in the Common Statement on Favourable Conservation Status agreed by the UK Statutory Nature Conservation Bodies (JNCC 2018).

The definition should be explicit about how the favourable levels are 'future-proofed' in the light of pressures and threats. Consideration of natural ecosystem function is critical in this regard – the more the definition sets favourable levels within the context of naturally functioning ecosystems, the greater the level of future-proofing.

Securing appropriate management, and addressing pressures or threats, are issues that relate to planning conservation measures and can be considered in plans and strategies for achieving favourable conservation status.

5.2 Considerations

Data and information on the following should be considered when defining favourable conservation status:

- Current situation
- Historical situation
- Future maintenance of biological diversity and ecological variation
- Constraints to expansion or restoration

5.2.1 Current situation

The definitions should consider the importance of the feature in an international or UK context. Where England's resource represents a large share of the wider resource, or a special position in the range, or distinct ecological characteristics, the level at which favourable conservation status is set may need to be high. In contrast, levels may be less ambitious if the England resource only forms a minor component of the wider ecological resource which is largely favourable.

5.2.2 Historical situation

The definition of favourable conservation status should not, necessarily, seek the restoration of pre-industrial or pre-historic conditions. However, the history of the habitat or species should be considered as far back as the evidence allows, as information from earlier times provides an invaluable context on what once was and what might be possible again. Understanding how features fit naturally into landscapes according to natural processes is critical context for establishing a definition that is ecologically coherent and supports general ambitions to restore individual features through more natural ecosystem function as far as this is possible.

5.2.3 Maintenance of biological diversity and ecological variation

Favourable conservation status should be defined so that the biological diversity associated with the feature will continue to thrive in the future. This means that favourable conservation status levels should be set so that the feature will be thriving as part of a naturally functioning ecosystem and be protected against catastrophic events and natural fluctuations.

Data, knowledge and evidence are usually insufficient to cover all aspects of diversity and ecological variation. However, any scientific evidence on how much is enough to ensure thriving habitats and species should be taken into account.

For habitats this means considering the role the habitat plays in supporting species throughout their range and the variation and distribution of the component vegetation communities.

For species this means considering:

- genetic variation and the ability of species to adapt to change, facilitated by having a robust genetic basis.
- the variety of species interactions with ecosystems in the landscape (for example, different life history traits in uplands compared to lowlands).
- the variation of conditions in which the species occurs, including optimal and sub-optimal habitat in naturally functioning ecosystems (historical distribution can be a proxy but may not reflect natural habitat variation).

5.2.4 Constraints to expansion or restoration

This relates to the ecological feasibility of restoration or expansion, taking an optimistic view of the future. In other words, whether the knowledge and techniques are available for an increase or restoration rather than the budgets or delivery mechanisms.

When defining favourable conservation status, the following aspects of ecological feasibility should be considered:

1. Natural ecological limitations (including physical/geographic boundaries, climate envelopes). These form the 'hard boundaries' of ecological potential.
2. Technical limitations to restoration (no conceivable measures, methodological constraints, timescales for restoration). An optimistic view should be taken as to what may be possible through technical advances that may be on the horizon.
3. Immovable constraints to an expansion or restoration. A long-term perspective should be taken when judging what's immovable, noting that perceptions may change. The immovable constraints currently accepted are:

    - Areas are no longer available because they are occupied by extensive built development such as cities, towns, ports and airports. Small areas of built development, single buildings, roads and railways are not considered immovable constraints.
    - Where the physical resources required have been completely destroyed. For example, the complete loss of rock formations through quarrying and peat through extraction, cultivation and oxidation.

The definition should be clear how immovable constraints have been taken into account and how the restoration levels have been set. Inclusion of additional immovable constraints to those listed above will require agreement from Natural England's Technical Steering Group.

The following factors should **not** be considered when defining favourable conservation status. They may limit the extent to which favourable conservation status is judged as achievable and should instead be considered when translating favourable conservation status into operational targets and measures:

1. Persistent pressures, issues and drivers. For example, where restoration success is dependent on structural shifts in economic or social sectors: air pollution, disease, invasive non-native species, agricultural intensification, fisheries.
2. Social-political acceptability. For example, where priorities, policies or public perception would need to change to enable achieving favourable conservation status.
3. Budget constraints. For example, where costs are prohibitive compared to current budgets.

There may be cases where it is not feasible to achieve favourable conservation status according to current knowledge. This would mean that the conservation status may remain unfavourable in the foreseeable future. This does not imply that the conservation of the feature is no longer important, or that the definition of favourable conservation status should be less ambitious, but that a policy decision is needed to define an appropriate target for the feature.

6. Approach on specific aspects

6.1 Units

The units used to describe favourable conservation status must be carefully chosen and be appropriate for the feature, based on its ecological characteristics. They can be critical to how favourable conservation status translates into contributions from local places. The resolution should be explicit to avoid ambiguity and to help clarify how individual localities contribute to favourable status. There should be a clear rationale for the choice of unit.

6.1.1 Range and distribution

This is the geographic unit that links a national favourable conservation status definition to local contributions. It determines the spatial scale at which local contributions are expected to a favourable range. For example, if a resolution of 5 km^2 is chosen it can be inferred that it doesn't matter exactly where within a 5 km^2 block a feature is located. Provided there is a sustainable contribution within the chosen unit, it contributes to a favourable range and distribution.

Wherever possible, the unit should be based on the spatial scale at which the feature naturally operates (for example, 1 km or 100 km) and its natural distribution pattern (widespread, restricted, scattered, etc.). However, data limitations may mean that the unit chosen is one for which data is available, and which is compatible with the spatial scale of the feature.

Possible choices of units include:

- National Character Area
- Catchment or sub-catchment (if clearly defined)
- Coastal sediment cell
- 10 km grid square
- 5 km grid square, tetrad, or 1 km grid square

6.1.2 Units for habitat area and species population

These must be different to the range and distribution unit.

Hectare is suggested as the standard unit for habitat area, but other units may be appropriate.

The following hierarchy (of declining preference) may be useful in choosing a unit for species population:

- Number of individuals and trend (specifying breeding/non-breeding as necessary);
- Other EU or JNCC agreed unit for reporting population size;

- Trend only (possibly for different subpopulations);
- Modelled population size. Figures are usually derived from models that are based on sample population surveys within a specific habitat and take account of the detectability of the species (that is, not confirmed counts in all areas).
- Confirmed (persistent) presence/absence within a geographical unit, or for a specific feature, but no indication of population size. For example, presence within 1 km grid squares, or ponds.
- Available habitat. Where there is a reliable association between habitat presence and species presence, the extent of habitat can be taken as a proxy for population.

6.2 Naturally functioning ecosystems

Definitions should set out the proportion of the habitat or species that should be found within naturally functioning habitat mosaics when in favourable conservation status. Definitions should characterise how the requirements of the feature are catered for in naturally functioning ecosystems, as a basis for understanding the extent to which favourable conservation status can be delivered through restoration of natural ecosystem function.

Naturally functioning habitat mosaics provide the best, most comprehensive, most resilient and sustainable expressions of biodiversity (Natural England 2018). They allow optimal conditions for a given habitat or species to be delivered in ways that provides optimal conditions for a wide range of habitats and species in complex and dynamic relationships. As far as possible, favourable conservation status should be defined on the basis of restoring natural ecosystem functioning whilst ensuring that critical, long-term dependencies of individual features on artificial habitat elements (for example, where natural niches are irreversibly lost) are recognised and encompassed within the definition.

There is no simple distinction between artificial and natural conditions – all habitats/ecosystems lie on a spectrum of natural function, determined by a range of component parts (the pillars in Figure 1). Each component can be at a different level of natural function within a given spatial unit. For instance, a highly managed grassland might be operating under natural hydrological and chemical regimes, whilst a more natural vegetation mosaic might occur within an area that is heavily drained or defended from flooding or erosion.

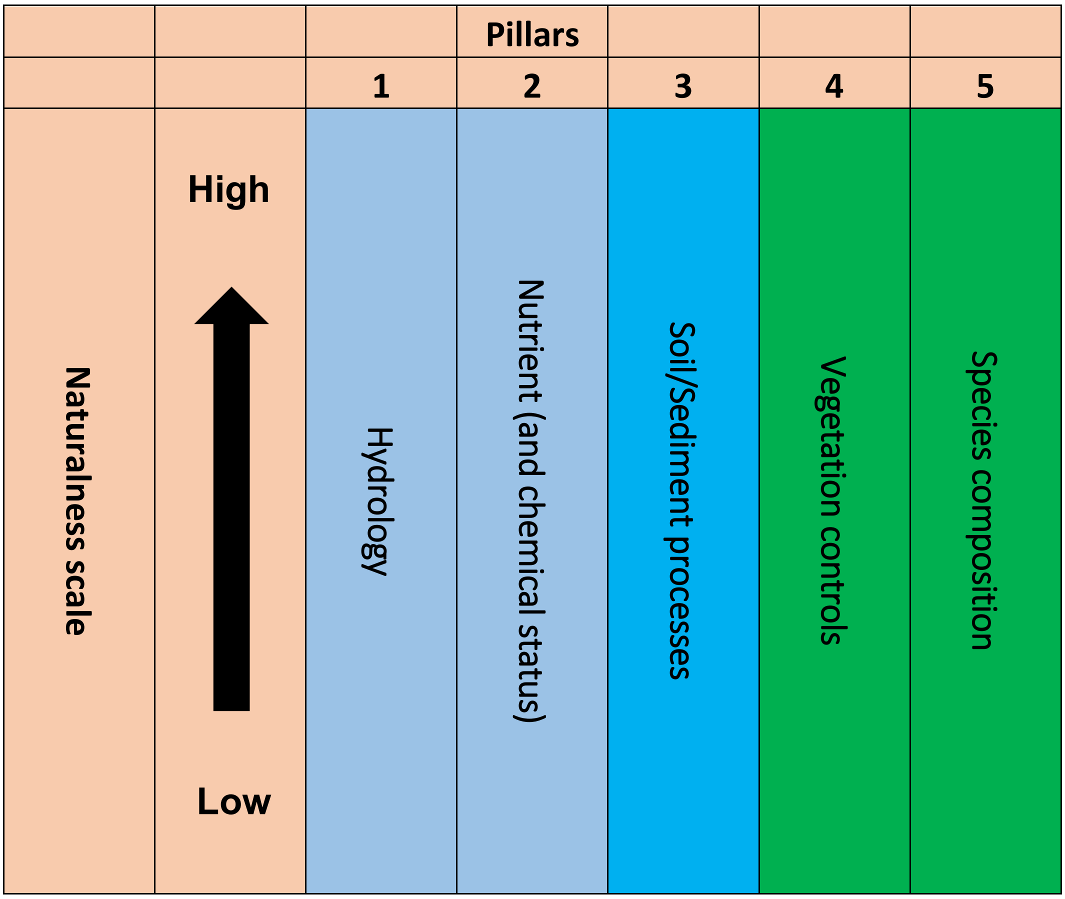


Figure 1. Key components of natural function (from Natural England 2018).

There will be considerable variation between different habitats and species in terms of i) the distribution of the habitat resource along the natural function spectrum, depending on how reliant the feature currently is on modified environments, and ii) the perceived scope for achieving favourable conservation status through restoration of more natural ecosystem function.

Gaps in our understanding of the current level of impact on aspects of natural function, and the scope for restoration, will mean that definitions framed in this way will be uncertain for some time but can be refined as our knowledge improves.

Definitions for habitats should draw on the habitat-based appendices of NERR071 on integrated biodiversity objectives (Natural England 2018). These are based on characterising the nature of natural ecosystem function, impacts upon that function and the scope/desirability for restoring higher levels. Definitions should aim to apportion favourable habitat extent into different levels of natural function, highlighting particular pillars that require focused attention. A classification of natural ecosystem function is currently being developed that will help calibrate these judgements.

There is considerable variation in the current level of reliance of individual species on habitat elements that can be described as artificial in one way or another. Consideration of ‘habitat-for-species’ is complicated by the different components of habitat used by species in their life cycles. Some habitat components may be functioning quite naturally (for example, feeding areas) whereas others might be highly artificial (for example, bird nesting sites on constructed platforms or in buildings).

Some species can exploit artificially created habitats and are able to passively spread into them and survive, or even thrive. Where possible, favourable levels should be defined so that there is a move towards more natural function. The ambitions set for habitats can inform the judgements for individual species, based on any associations between the species and different habitats (this is described for some species in Natural England 2018 NERR071). At the level of individual pillars of natural function, it should be noted that none of the five pillars obviously caters for physical constructions used by individual species (for example, buildings, bridges, walls, nesting facilities) – these are best accommodated in Pillar 3.

The extent of inclusion of highly artificial habitats within the definition of favourable conservation status will be dictated by the extent of critical dependency of the species on human modifications to landscapes, either in the short-term (as ark sites) or the long-term (because of an intractable lack of natural habitat). There should be an individual justification for the inclusion of artificial habitats within the definition. Artificial habitats supporting a species outside of its natural range and distribution should not be considered within the definition of favourable conservation status.

In addition to drawing on habitat definitions, possible bespoke habitat-for-species statements to include in the definition might be:

- at least x% of the population should sit within highly naturally functioning ecosystems (applicable to plant, animal and fungal species with very limited spatial movements);
- at least y% of nest sites should be natural, sitting within highly naturally functioning habitat mosaics;
- at least z% of the foraging habitat should be within highly naturally functioning habitat mosaics.

When defining favourable conservation status in this way it is critical that perverse outcomes and pressures on vulnerable features are avoided. Whilst restoration of natural ecosystem function is a critical endeavour, existing biodiversity can be at risk from measures that fail to take adequate account of the dependencies on modified environmental conditions. For threatened species that are less able to adapt, remaining populations are best conserved in current environmental conditions and restoration of natural function may best be targeted elsewhere (preferably nearby where natural colonisation is possible or otherwise by translocation).

Defining the favourable habitat-for-species in this way may have a bearing on the definition of favourable population, particularly for less threatened species. Artificial habitats can provide unnatural levels of optimal habitat for a species, such that shifting emphasis from artificial habitats in favour of naturally functioning habitats may require a lower favourable population size. However, any such action should consider the need to ensure that the favourable population size for threatened species with low population levels is set large enough to confer resilience, particularly in the face of climate change. The over-riding imperative is to avoid accommodating natural ecosystem function in favourable conservation status definitions in a way that threatens or undermines critical measures to secure population viability.

6.3 Impact of climate change

The range and distribution of many habitats and species is influenced by climate. The effect of climate change on the distribution of a habitat or species can be categorised as follows:

1. increase (expanding distribution without loss elsewhere)
2. contraction (reduced distribution without increase elsewhere)
3. shift (for example, both increase northwards and decrease southwards)
4. change – in the case of habitats – a similar habitat may persist, but with a changed combination of species as not all species in a community will respond in the same way to climate change

Biodiversity conservation should act to reduce the vulnerability and increase the resilience of sites and species likely to be sensitive to climate change. In this context, resilience is the capacity for features (species, habitats and geological features and processes) to persist under climate change and recover from extreme events associated with climate change. A resilient ecological network (meaning a situation where sympathetic management is in place and key pressures such as fragmentation, hydrological modification, recreational pressure, air pollution, etc. are addressed) should enable the habitat or species to withstand and adapt to climate change impacts as far as possible.

Increase in distribution

Increases in distribution are often hailed as positive changes. Yet they may well be driven by climate change, with concurrent losses elsewhere in the habitat's or species' range. Thus, any expanded range should not necessarily be defined as favourable. As the favourable value marks the threshold between a thriving situation and an unfavourable situation, setting the favourable value above the current situation in expectation of climatic shifts would mean that the current situation is unfavourable and climate change is required to achieve favourable status.

Therefore, in most cases the definition of favourable should be based on the current situation using one of the methods in Section 7.

Contraction in distribution

A contraction in distribution should be prevented as far as possible through building resilience (focused on removing pressures and restoring natural ecosystem function). In terms of defining favourable conservation status, the favourable value should be defined irrespective of the expected loss. This encourages the building of resilience (instead of giving up) and acknowledges that predicting the future distribution is inherently uncertain. Climate change could then lead to an unfavourable conservation status, while action is driven by a strategy to compensate for the impacts.

Shift in distribution

An expected shift in distribution raises the question of how long a favourable reference value ought to be valid. It is precautionary to focus conservation efforts on enabling the species or habitat to shift their range. However, defining a favourable reference value in line with this expectation could give the wrong signal - that we give up on some examples and that the climate change impact is needed to achieve favourable conservation status. Instead, the likely impact should be acknowledged. Favourable distribution should be defined as normal, while the strategy to maintain or achieve favourable conservation status focusses on enabling the feature to shift its range.

Changing character

Favourable distribution should be defined using one of the methods in Section 7 but it should be made clear that changing species composition of habitats should be monitored and reviewed at regular intervals. Review points should be flexible as they may need to vary as the situation evolves over decades.

6.4 Translocations

All self-sustaining populations of a species, or examples of a habitat, that are found within the natural range and distribution of the species or habitat should be counted as part of the current population or extent within a definition and therefore contribute to the favourable population or favourable habitat area.

This includes populations or examples that are the result of a translocation - the deliberate movement of organisms from one site to another – or habitat creation – re-establishing habitat in areas from which it has been lost. The translocation or habitat creation does not have to have been carried out for conservation purposes. Provided the species or habitat is self-sustaining and occurs within the natural range and distribution it can contribute to the favourable situation.

Where such examples are excluded, the author should justify why the translocated or created examples are not included. For example, it may be because there is a negative impact on the favourable conservation status of another feature or because the translocated populations are not the native genetic variety or because the populations or created habitat is outside the natural range and distribution.

7. Methods

The following sections describe methods that can be used to define favourable conservation status for habitats and species. Sections 7.1 to 7.7 form a hierarchy of methods that should be considered in order when determining favourable values. Each method should be considered in turn and accepted or rejected as the method to determine the favourable values according to the evidence available, until the most appropriate method is reached.

Different methods can be used for different habitats and species. The most applicable method will depend on the available data and evidence, and on the nature and ecology of the feature in question. The choice and precise application of each method will include a degree of pragmatic judgment. Where appropriate, more than one method can be considered in relation to a feature and methods other than those described in this document can be used. The choice of method/s should be justified based on the ecology of the feature.

7.1 Current values

Use the current value as the favourable value. Use the following checklist to indicate whether the current value represents the favourable value. Note that one positive indicator does not automatically mean the current situation is favourable. Also, not all indicators need to be positive to judge the current situation as favourable. In general, the more indicators that point to a favourable situation, the more confident we can be that the current value is the favourable value. Judgments should be justified on a case-by-case basis.

- Current value matches the ecological potential;
- No significant decline or loss compared to the historical situation;
- For species, IUCN status is ‘Least Concern’ in England (if assessment available) or GB;
- Includes all relevant ecological and geographic variation, sufficient to support the biological diversity associated with the habitat or species.
- Range is sufficiently large for favourable area/population and habitat structure & function;
- Habitat area is sufficient to sustain viable habitat examples (favourable structure and function) throughout the natural range;
- Area and quality of supporting habitat for species is sufficiently large and suitable for favourable population and distribution

7.2 Historical values

Use a historical value as the favourable value when the historical value is considered to represent the favourable value. For example, a historically stable situation may provide evidence of a favourable situation before changes occurred due to reversible pressures.

7.3 Habitat potential mapping

Habitat potential mapping can be used to define natural limits to range and distribution. The mapping identifies the environmental boundaries to the occurrence of a habitat or species, for example, soil characteristics and climate envelopes, and therefore where, in terms of environmental attributes, the habitat or species could occur. The resulting range and distribution would represent the full ecological potential and can be used to define the favourable range and distribution.

For species, a favourable population could then be defined to occupy the full ecological potential.

Similarly, for habitats, the favourable area could then be defined as the full habitat potential area. This should be considered for habitats of limited extent, little modified by human agency (greater natural function), and with a high number of associated threatened species and/or highly degraded structure and function attributes.

Alternatively, for the favourable area of a habitat, figures for the historical extent could be used supported by the habitat potential maps (perhaps in conjunction with other data). This may be appropriate for habitats that were once widespread over a landscape, which, although developed through some human modification, have many aspects of naturally functioning habitats and are associated with a large number of threatened species.

7.4 Habitat network mapping

The habitat network mapping completed by Natural England can be used to define the favourable area and the favourable range and distribution of habitats (Natural England 2020).

The favourable values are set to cover the current distribution plus the essential areas to create a habitat network, filling gaps in the current distribution and addressing connectivity requirements. This method may be more appropriate for heavily modified habitats, with a lower number of associated threatened species.

For species associated with one of these habitats, a favourable population and favourable range and distribution could then be defined to occupy the habitat network.

7.5 Sustainable local populations and population densities for favourable species population

For some species there may be evidence of sustainable local population sizes or population densities. For example, there may be academic literature on species-specific sustainable populations levels (Traill and others 2010; Traill and others 2007; Flather and others 2011; Frankham and others 2014) or data might be available on sustainable population sizes and population densities from other countries or for similar species.

Information on sustainable local population sizes or population densities may be used to estimate the favourable population required to occupy the favourable distribution. Data on sustainable local population sizes will have to be combined with an assessment of the number of core populations needed to occupy the favourable distribution. For example, 15 core populations may be needed across the country to ensure a species is thriving throughout its natural range. The number of core populations needed may be based on the range unit or the scale at which a population naturally operates. A national favourable population size can be estimated by multiplying the number of core populations with the size needed for each population to function sustainably.

Where species-specific evidence on sustainable local populations is absent, generic rules of thumb could be used based on literature, to make assumptions on sustainable local population sizes. For example:

- Belgium (Flanders) used 5,000 adults as a minimum for Annex II species (with variations according to lifespan), multiple connected populations can make up a single core meta-population (McConville & Tucker 2013).

- The Netherlands used standardised minimum core population sizes for breeding birds (Ministerie van LNV 2006). These numbers are assumed to represent a minimum sustainable population in the Netherlands (with less than 5% chance of extinction in 100 years presuming habitat size and quality remain unchanged) and have been used to quantify national conservation objectives for Natura 2000:
    - 20 pairs for long lived birds (annual mortality 25%-35%)
    - 40 pairs for birds with medium lifespan (annual mortality 35%-45%)
    - 100 pairs for short lived birds (annual mortality 45%-55%).

7.6 Increase a set percentage of historical loss

This is a method that can be used to develop a favourable value for habitat area or for species population where there are evidence gaps and large historical losses.

Three main factors (listed below) are each assessed for the potential scale of restoration through expert judgment:

1. **The current status of the feature**. Restore more of the historical loss if the feature is rare and endangered compared to when the feature is still extensive/widespread and not threatened despite declines.

2.1 **Habitat - Structure and function attributes/threatened species**. Restore more where the habitat is highly fragmented and/or an increase in patch size is required for greater natural functioning, to encompass all structure attributes or for associated species to be Least Concern.

2.2 **Species - Requirements for biodiversity conservation.** The degree of increase needed to achieve sustainable representation throughout the natural range, taking account of the international responsibility, ecological variation, the status of dependent features and minimum viable populations.

3. **The technical potential for restoration**. The degree to which an increase from current levels is technically feasible. A bigger level of restoration could be expected where there are few immovable constraints compared to when historical losses are largely irreversible.

The scale of restoration is classified as A, B or C to provide a very basic indicative order of magnitude for restoration action for favourable conservation status (see Table 1). Classification is not intended to precisely define the situation. The method only needs a judgment on which class a feature would belong to ‘more than the other classes’.

Table 1: Classification of scale of restoration action

Factor	Scale of restoration action		
	A – Less restoration	B – Intermediate level of restoration	C – More restoration
Current status	Widespread/extensive, largely sufficient (for example, favourable in UK reporting on progress towards FCS; IUCN red list status: Least Concern[1])	Some habitat/populations unsustainable (for example, inadequate in UK reporting on progress towards FCS; IUCN status: Near Threatened)	Mostly insufficient/scarce and unsustainable (for example, bad in UK reporting on progress towards FCS; IUCN status: Vulnerable, Endangered, Critically Endangered)
Habitat: structure and function **Species: requirements for biodiversity conservation**	Habitat - little structure and function degradation due to reduced area. Few associated threatened species. Species - No significant UK or international importance	Habitat – structure and function attributes somewhat degraded. Some associated threatened species. Species - High UK or international importance	Habitat – structure and function highly degraded. Large number of associated threatened species across several taxon groups. Species - Very high UK or international importance
Technical potential	Minimal potential. Most historical loss irreversible	Moderate potential. Some historical loss irreversible	Good potential. Most historical loss reversible

Using these classifications, derive an indicative 'proportion for restoration of the historical loss' from the table below. The proportions for restoration are based on the principle that a larger proportion of the historical loss should be restored if the current situation shows more deficiencies. The proportions have been stratified from the top left corner to the lower right corner of the table, with bigger steps towards the higher end to account for the uncertainty in defining favourable conservation status the further we are currently removed from it.

Note: these proportions are not based on evidence, but simply reflect a simple, stepped increase the more reasons there are for restoration (from AAA to CCC). Also, there is no 1:1 relationship between proportion of *historical loss* and a proportion above current value (for example, 25% above current value corresponds to 100% of historical loss if there was a 20% decline; but 5% of historical loss if there was an 83% decline).

[1] For explanation of IUCN categories see IUCN 2020.

Table 2: Proportions for restoration

Current status	Structure & function/biodiversity conservation	Potential A	B	C
A	**A**	0-5%	5%	10%
	B	5%	10%	15%
	C	10%	15%	20%
B	**A**	15%	20%	25%
	B	20%	25%	30%
	C	25%	30%	40%
C	**A**	30%	40%	50%
	B	40%	50%	75%
	C	50%	75%	90-100%

7.7 IUCN red list criteria

For declining very rare and/or range-restricted species, where information on status is limited, the favourable range and population levels can be set at a level which would lead to an IUCN assessment of Least Concern in England.

7.8 Methods for patch size

Optimum patch size, and the proportion of the resource needed to meet this patch size, can be taken from the published literature.

Alternatively, where there are evidence gaps, the figures at Annex 2 can be used to define patch size. At least 80% of the habitat should be the defined patch size for favourable status.

7.9 Methods for habitat quality

Use an envelope of 95-100% of the favourable habitat area meeting a minimum quality standard to define the favourable structure and function at an England scale. 95% of area in favourable condition is the UK agreed standard for favourable structure and function for designated sites.

An alternative figure can be used by exception. Judgments should be based on ecological considerations only. For example, where it is not necessary for a very extensive habitat type to meet minimum thresholds across its whole area to support thriving populations of associated species. The rationale for the chosen figure must be set out clearly.

Authors have discretion to propose that designated sites should meet higher thresholds than those which have not been designated. This judgment must be habitat specific, dependent on the nature of how the habitat is classified and also the criteria on which the designated sites qualify for selection.

7.10 Associated species

All species whose lifecycle is wholly or partly dependent on the habitat should be Least Concern at an England or GB level in terms of the IUCN criteria. That is, none of the dependent associated species should be at risk of extinction when the habitat is in favourable status.

A habitat definition should therefore identify any species which is IUCN Threatened at a GB scale (or greater) whose lifecycle is wholly or partly dependent on the habitat. Where formal IUCN status assessments are not available yet, include species whose populations are declining at a level that would be likely to qualify a species for categorisation as an IUCN threatened species, if a formal assessment were to be completed.

Information on the ecological requirements of these species can be used to inform a judgment on favourable levels for the other parameters. Where threatened species are associated with particular microhabitats or issues, this may indicate areas for further consideration in relevant implementing strategies.

7.11 Habitat for the species

Consider the following when defining the favourable habitat:

- How large does the habitat need to be to sustain the favourable population throughout the range?
- What habitat quality is needed for long-term survival of the species across the favourable distribution?
- Is it possible to integrate size and quality into a single metric for favourable habitat for the species (for example, great crested newts: number of ponds with habitat suitability index > 0.7).

If the habitat area for a sustainable local population is known, the favourable habitat can be derived by estimating the number of local populations within the favourable population and range and multiplying up the habitat area accordingly.

Annex I: References

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Annex 2: Indicative patch size for minimum desirable functioning

The following indicative patch sizes are based on work undertaken in the Netherlands (Ministerie van Economische Zaken 2014). They are derived from a simple classification of habitats according to their ecological functioning, using classes with a factor 10 difference: 10 m^2, 100 m^2, 0.1 ha, 1 ha, 10 ha, 100 ha.

- >10 m^2 was used for very small-scale habitats (for example, tufa forming spring heads);
- >100 m^2 for habitats with simple vegetation structure, that don't require space for internal abiotic variation or typical fauna species (for example, dunes with *Salix repens*; depressions on peat substrate with *Rhynchosporion*);
- >1 ha was used for habitats where (small scale) abiotic variation is important (for example, pH gradients), or that require a zonation in vegetation structure at small scale, or where some species demand bigger size (for example, butterflies). Examples: wet heaths; *Molinia* grasslands.
- >10 ha was used for habitats that depend on small scale geomorphological processes *internal* to the habitat (for example, sand blow in dunes); where large-scale variation in vegetation structure is required (for example, woodland structure) or where fauna species set spatial requirements (for example, breeding birds). Examples: mobile dunes.
- >100 ha was used for habitats that require large scale geomorphological processes *internal* to the habitat for conservation of the natural system (for example, subtidal sandbanks). Note that many habitats depend on processes *external* to the habitat as well, such as tidal flow but these don't determine the optimal size of the habitat but should be considered at landscape scale.

The term 'functional size' indicates that a habitat does not necessarily need to be contiguous, as long as the gaps between habitat patches do not impede functioning.

The figures build on ecological theory: the opportunities for functioning of communities increase with size following an S-curve. Where the (habitat-unique) curve starts to level-off, spatial requirements are satisfied to a relatively high degree - the classes would indicate roughly these points. The figures further incorporate studies on the spatial requirements for sustainable populations of species (Verboom 2001; Kalkhoven & Reijen 2001; Bal and others 2001)

Some of the figures have been modified to reflect evidence from England. For example, The Nature Networks Evidence Handbook (Natural England 2020) suggests a woodland patch size of 40 ha or 100 ha for wider-ranging species or those with specialist requirements and low dispersal abilities. Therefore, a 40 ha figure is used in this table. Other changes have been noted below.

Code	Feature name	Indication of size for minimum desirable functioning
H1110	Subtidal sandbanks	>100 ha
H1130	Estuaries	>100 ha
H1140	Intertidal mudflats and sandflats	>100 ha
H1160	Shallow inlets and bays	>100 ha
H1310	Glasswort and other annuals colonising mud and sand	>100 m^2
H1320	Cord-grass swards	>100 m^2
H1330	Atlantic salt meadows[2]	>100 m^2
H2110	Shifting dunes	>1 ha
H2120	Shifting dunes with marram	>10 ha
H2130	Dune grassland	>1-10 ha
H2150	Coastal dune heathland	>100 m^2
H2160	Dunes with sea-buckthorn	>1 ha
H2170	Dunes with creeping willow	>100 m^2
H2190	Humid dune slacks	>1-10 ha
H2330	Open grassland with grey-hair grass and common bent grass of inland dunes[3]	>10 ha
H3110	Nutrient-poor shallow waters with aquatic vegetation on sandy plains	>1 ha
H3130	Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	>1 ha
H3140	Calcium-rich nutrient-poor lakes, lochs and pools	>100 m^2-1 ha
H3150	Naturally nutrient-rich lakes or lochs which are often dominated by pondweed	>1 ha
H3160	Acid peat-stained lakes and ponds	>1 ha
H3260	Rivers with floating vegetation often dominated by water-crowfoot	>1 ha
H4010	Wet heathland with cross-leaved heath	>10 ha
H4030	European dry heaths	>10 ha
H5130	Juniper on heaths or calcareous grasslands	>1 ha
H6130	Grasslands on soils rich in heavy metals	>100 m^2
H6210	Dry grasslands and scrublands on chalk or limestone (important orchid sites)[4]	>0.5 ha
H6230	Species-rich grassland with mat-grass in upland areas	>1ha
H6410	Purple moor-grass meadows[4]	>0.5 ha

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[2] 100 m^2 suggested (instead of 1 ha in Netherlands) as sites in England are often naturally small as based on brine springs. (Jefferson pers. com.)

[3] >100 ha is not appropriate in England given the scale of occurrence. (Jefferson pers.com)

[4] 0.5 ha instead of 1 ha in the Netherlands suggested here in line with SSSI guidelines.

Code	Feature name	Indication of size for minimum desirable functioning
H6430	Tall herb communities	>1 ha
H6510	Lowland hay meadows[4]	>0.5 ha
H6520	Upland hay meadows	>0.5 ha
H7110	Active raised bogs	>100 ha
H7120	Degraded raised bog	>100 ha
H7140	Very wet mires often identified by an unstable `quaking` surface	>1 ha
H7150	Depressions on peat substrates	>100 m^2
H7210	Calcium-rich fen dominated by great fen sedge (saw sedge)	>100 m^2
H7220	Hard-water springs depositing lime	>10 m^2
H7230	Calcium-rich springwater-fed fens	>100 m^2
H9160	Oak-hornbeam forests	>40 ha
H9190	Dry oak-dominated woodland	>40 ha
H91A0	Western acidic oak woodland	>40 ha
H91D0	Bog woodland	>40 ha
H91E0	Alder woodland on floodplains	>40 ha

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